Answers **Lesson 4 Warm Up Quiz**

Math 2B: Applied Linear Algebra

True/False

For the problems below, circle T if the answer is true and circle F is the answer is false.

1.	**T**	F	If $\mathbf{x} \in \mathbb{R}^n$ and $f(\mathbf{x}) = \mathbf{x}^T$, then $\mathrm{Dom}(f) = \mathbb{R}^n$
2.	T	**F**	If $f(\mathbf{x}, \mathbf{y}) = a\mathbf{x} + \mathbf{y}$, then the domain space of f is $\mathbb{R}^n$
3.	**T**	F	A vector $\mathbf{x} \in \mathbb{R}^n$ and its additive inverse $-\mathbf{x} \in \mathbb{R}^n$ have equal lengths, as computed with the euclidean norm.
4.	**T**	F	For vectors $\mathbf{x}, \mathbf{y} \in \mathbb{R}^n$, the distance between $\mathbf{x}$ and $\mathbf{y}$ is given by $\\|\mathbf{x} - \mathbf{y}\\|_2$.
5.	T	**F**	If $f(\mathbf{x}) = \\|\mathbf{x}\\|_2$, then $\mathrm{Rng}(f) = (0, \infty) \subseteq \mathbb{R}$.
6.	**T**	F	Let $\mathbf{x}, \mathbf{y} \in \mathbb{R}^n$. If we add $\mathbf{x}$ to the vector $\mathbf{y} - \mathbf{x}$ we get the vector $\mathbf{y}$.
7.	T	**F**	The vectors $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ and $\begin{bmatrix} -4 \\ 4 \end{bmatrix}$ represents points on a line that passes through the origin.
8.	T	**F**	For vectors $\mathbf{x}, \mathbf{y} \in \mathbb{R}^n$, $\mathbf{x}^T + \mathbf{y}^T \in \mathbb{R}^n$
9.	T	**F**	If $\mathbf{u}, \mathbf{v}$, and $\mathbf{w}$ are non zero vectors in $\mathbb{R}^2$, then $\mathbf{w} = c_1\mathbf{u} + c_2\mathbf{v}$ for some $c_1, c_2 \in \mathbb{R}$.
10.	T	**F**	For any scalar $c \in \mathbb{R}$ and any vector $\mathbf{x} \in \mathbb{R}^n$, we have $\\|c\,\mathbf{x}\\|_2 = c\,\\|\mathbf{x}\\|_2$.
11.	T	**F**	The "length" of any vector in a $\mathbb{R}^n$, measured by the euclidean norm, is always positive.
12.	**T**	F	The vectors $\begin{bmatrix} 1 \\ -1 \end{bmatrix}$ and $\begin{bmatrix} -4 \\ 4 \end{bmatrix}$ represents points on a line that passes through the origin.

13. **T** F Let $\mathbf{x}_1, \mathbf{x}_2 \in \mathbb{R}^n$ for $n \in \mathbb{N}$. If $y = \frac{3}{2}\,\mathbf{x}_1$, then $\mathbf{y}$ is a linear combination of $\mathbf{x}_1$ and $\mathbf{x}_2$

Multiple Choice

For the problems below, circle the correct response for each question.

1. Recall that we used a spring in class modeled by the equation $f(e) = ke + b$ where $k = 17.57$ N/m and $b = 0.064$N. Which of the following gives an ideal version of vector $\mathbf{e}$ (where entries are measured in m) if we hang masses encoded in the mass vector

$$\mathbf{m} = \begin{bmatrix} 0.00 \\ 0.10 \\ 0.20 \\ 0.30 \\ 0.40 \end{bmatrix}$$

In this case, assume elongation measurements are given in meters (m) and are rounded to 4 digits to the right of the decimal place. Each entry of $\mathbf{m}$ is measured in units of kilograms (kg). Remember the unit equation $1\text{ N} = 1\frac{\text{kg}\cdot\text{m}}{\text{s}^2}$. Also, sssume the acceleration due to gravity is 9.8 m/s^2.

A. $\begin{bmatrix} 0.064 \\ 1.821 \\ 3.578 \\ 5.335 \\ 7.092 \end{bmatrix}$ **B.** $\begin{bmatrix} -0.0036 \\ 0.0521 \\ 0.1079 \\ 0.1637 \\ 0.2195 \end{bmatrix}$ C. $\begin{bmatrix} -0.0036 \\ 0.0020 \\ 0.0077 \\ 0.0134 \\ 0.0191 \end{bmatrix}$ D. $\begin{bmatrix} 0.00 \\ 0.98 \\ 1.96 \\ 2.94 \\ 3.92 \end{bmatrix}$ E. $\begin{bmatrix} 0.064 \\ 17.2826 \\ 34.5012 \\ 51.7198 \\ 68.9384 \end{bmatrix}$